# TEST PROCEDURE

| TP 751D | |
|---|---|
| **Title** | **Page Number** |
| Heavy-Duty Diesel Engine Setup | 1 of 20 |
| **Originator** | **Supersedes** |
| Daniel C. Stokes, Mechanical Engineering Technician | TP 751C |
| **Responsible Organization** | **Computer Program** |
| Testing Services Division - Heavy-Duty Engine Testing | |
| **Type of Test Report** | **Data Form Number** |
| Data Form | Forms 751-01 and 751-02 |
| **Report Distribution** | **Implementation Date** |
| Test Packet | 11-20-95 |

## Implementation Approval

Original Test Procedure Authorized by EPCN #150 on 04-21-94

## Revision Description

11-20-95 The purpose of this change is to revise the procedure as described in EPCN #177.

**Note**: Specific brand names in EPA/EOD procedures are for reference only and are not an endorsement of those products.

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## 1. Purpose

The purpose of this procedure is to detail the methods used to set up a diesel engine for dynamometer testing. Two general areas will be covered - installing the engine on the mounting pallet and installing the engine/pallet assembly on the dynamometer.

## 2. Test Article Description

Diesel engines submitted for testing to the Environmental Protection Agency (EPA) Testing Services Division (TSD) Heavy-Duty Engine Testing (HDET). This procedure especially applies to engines defined as heavy-duty engines in the Code of Federal Regulations.

## 3. References

3.1 "MSAPC Advisory Circular 22A," April 3, 1973

3.2 "Code of Federal Regulations," Title 40, Part 86, Subpart A, Section 86.082-2

3.3 Environmental Protection Agency (EPA) current safety policies

3.4 SAE J1937, "Engine Testing with Low Temperature Charge Air Cooler Systems in a Dynamometer Test Cell" (for engines with intercoolers)

## 4. Required Equipment

4.1 "Engine Identification and Test Number Assignment" (Attachment A)

4.2 Form 751-01, "HDET - Engine and Test Specifications," (Attachment B)

4.3 Form 751-02, "HDET - Diesel Engine Setup," (Attachment C)

4.4 Form 903-01, "Test Status Report"

4.5 Electric Engine Dynamometer, capable of motoring and absorbing

Equipment used: G.E. Model #42G408AD

4.6 Engine mounting pallet

Equipment used: Bay City Foundry or custom fabricated

4.7 Engine mounting adjustable stands and fittings

Equipment used: Bay City Foundry

4.8 Flywheel adapter

Equipment used: custom fabricated

4.9 Motor mount adapters

Equipment used: custom fabricated

4.10 Throttle actuation servo motor

Equipment used: Foxboro-Jordan Model #MC10596

4.11 Engine-to-dynamometer drive shaft

Equipment used: custom fabricated

4.12 Thread locking compound

Equipment used: Compound must meet Torque, in-lb break/prevail 160/225 standard

4.13 Mechanic's tools

4.14 Portable heavy-duty crane

Equipment used: OTC #1814

## 5. Precautions

5.1 At a minimum, the engine mountings must be Original Equipment Manufacturer (OEM) equivalent to withstand engine torque and vibration.

5.2 The engine must be level and its height adjusted to provide a distance of 34 inches or 36 inches from the floor to the crankshaft center line. The crankshaft center line must not be at a height of 35 inches.

**Note:** The dynamometer drive shaft is 35 inches above the floor and the crankshaft cannot be at the same height as the dynamometer drive shaft.

5.3 Mounting bolts must not bottom in blind bolt holes.

5.4 Rotating components must be concentric and properly aligned.

5.5 All bolts on rotating equipment must be grade 8 or better (at least 5 hash marks on the bolt head), and all lock-washers on rotating components must be new star washers.

5.6 Thread locking compound (such as Loctite ®) must also be used on all driveline fasteners.

5.7 All attachments, lines, hoses, and peripheral equipment must be secured away from rotating or hot engine components.

5.8 The drive shaft and torque transducer must have the safety shields and safety shield auxiliary chains installed.

5.9 Protective gloves must be worn when handling used motor oil.

5.10 When completing fuel system connections, no fuel system threads or fittings are to be interconnected without proper mating adapters.

5.11 Eye protection must be worn when priming the fuel system.

5.12 All metal-to-metal connections in the auxiliary intercooler air tubing must be welded to provide safe and leak-free connections.

5.13 All connections between the auxiliary intercooler air tubing and the intercooler and engine components must be secured with band clamps. These connections must be reinforced with turnbuckles or some other method to assure joint integrity under pressure.

5.14 Any person entering the test cell during engine operation must wear hearing protection, safety glasses, and safety shoes. This person must stay out of line with rotating engine and drive shaft components as much as possible.

## 6. Visual Inspection

6.1 The engine is inspected for damage upon delivery to the EPA.

6.2 Upon completion of the installation, the engine setup is inspected per instructions on Form 751-02.

## 7. Test Article Preparation

7.1 Review Form 751-01 to verify that the data are reasonable and complete. The data on this form is provided by the Project Officer. The Project Officer will document all special testing requirements in the "Additional Instructions" section of Form 751-01.

7.2 On a large envelope, which will be called the "test packet," record the "Engine Identification," which is provided by the customer, see Attachment A.

Look at the HDET log book and determine which next sequencal numbers will be assigned by the Cellmate II. This will be the "Test Number." Record this number on the packet.

7.3 Locate the data forms that are required for the specified tests. Record the "Engine Identification" and "Test Number" on each form. The following is a list of all forms available:

Form 751-02, "HDET - Diesel Engine Setup" (see Attachment C)

Form 752-01, "HDET - Diesel Engine Prestartup Inspection" (see TP 752)

Form 752-02, "HDET - Diesel Engine Startup" (see TP 752)

Form 753-01, "HDET - Diesel Engine Break-in" (see TP 753)

Form 754-01, "HDET - Diesel Engine Mapping" (see TP 754)

Form 755-01, "HDET - Diesel Engine Cycle Performance" (see TP 755)

Form 756-01, "HDET - Diesel Transient Pretest Checksheet" (see TP 756)

Form 756-02, "HDET - Diesel Transient Test" (see TP 756)

Form 756-03, "HDET - Diesel Engine Transient Test Particulate Data" (see TP 756)

Form 757-01, "HDET - Analyzer Operator Pretest Checklist" (see TP 757)

Form 757-02, "HDET - Analyzer Operator Transient Test Checklist" (see TP 757)

Form 757-03, "HDET - Diesel Exhaust Particulate Sampler Data" (see TP 757)

Form 758-01, "HDET - Particulate Filter Data" (see TP 758)

Form 759-01, "HDET - Diesel Engine Smoke Exhaust Test" (see TP 759)

## 8. Test Procedure

This section details the steps necessary to install a diesel engine on a pallet and to install the engine/pallet assembly to the dynamometer.

The 100 Series details the assembly of the engine to the pallet. If the engine arrives mounted on a pallet and meets the requirements of Steps 100 through 113, go to Step 200.

The steps in section 200 detail the procedures used to install the pallet mounted engine on the dynamometer. The steps in section 300 detail the procedures used when an auxiliary intercooler is required.

101 Locate the test engine, engine mounting pallet, engine mounting adjustable stands, and fittings. Deliver the items to the assembly area.

102 If necessary, remove the engine from the shipping skid or crate to facilitate inspection.

Verify that all engine parts are attached and that the components are not broken, bent, or rendered inoperable. Verify that the engine is equipped with a flywheel. Verify that all engine openings (air inlet, exhaust, fuel, water, and others) which could allow foreign material to enter the engine are sealed.

Notify the Project Officer if a problem is noted (e.g., a missing flywheel) before further action is taken.

103 Using the dipstick, check the engine oil level. On a tag, record the observed oil level, your name, and the date. Hang the tag on the engine dipstick.

If the engine was to be shipped without oil, remove the oil drain plug to remove any remaining oil. Notify the Heavy Duty Engine Testing (HDET) Supervisor if the oil was not drained prior to shipment.

104 Install the adjustable stands on the pallet using the correct bolts provided by the stand manufacturer. Generally, two of the largest stands are used for the rear of the engine and two of the medium-sized stands are used for the front. Hand-tighten the through bolts. To allow for the engine's length, it may be necessary to loosen and move the front mounting plates on the pallet.

105 Verify that the engine is equipped with a front mount which provides at least two mounting bolt holes through a horizontal surface.

If the engine is not so equipped, procure a mount from the manufacturer or fabricate mounts in-house. Use bolts which fit the mounting bolt holes.

106 Install the rear engine mounts to the engine. A selection of these mounts is available from RDSD personnel. Existing mounts can often be modified (e.g., by drilling new attachment holes or removing small amounts of metal).

If no mounts are available, they will have to be designed and fabricated by Machine Shop personnel or an outside contractor.

107 Using the portable heavy-duty crane, set the engine over the rear adjustable stands and align the mounts with the stands.

If the rear mounts are angled (such that the mount-to-stand flange is not parallel to the floor), it will be necessary to install ball adapters to allow for this angle. Loosely install the mounting bolts.

108 Select an appropriate piece of steel stock, minimum 1/8 inch thick, for use as a front mount adapter. This will span between the two front adjustable stands. Often, a piece of channel iron is sufficient. Put the bolts through the appropriate holes or drill new holes as needed, taking care not to unduly weaken the mount adapter. Holes through the flange of the channel must be kept to a minimum.

If necessary, have a new mount adapter fabricated. Use large, thick washers between the stands and the adapters, and between the adapters and the bolts. Tighten the engine-to-adapter bolts and loosely install the mounting bolts to the stands.

109 With the engine loosely mounted and the portable heavy-duty crane bearing the engine weight, set the adjustable stands so that the engine is centered on the pallet and the bottoms of the stands are parallel with the horizontal surface of the pallet.

110 Carefully lower the engine onto the pallet assuring that the stands remain parallel to the pallet. Firmly tighten all the mounting bolts.

111 Adjust the engine height. Ensure that the pinch bolts on the base of the adjustable stands are loose enough to allow height adjustment of the engine. Adjust the center line of the crankshaft to either 34 inches or 36 inches from the floor. Tighten the pinch bolts.

112 Install the flywheel adapter. Select an appropriate flywheel to drive shaft adapter. Install the adapter on the engine flywheel, using correctly sized grade 8 bolts with new star washers and required thread locking compound. Adapter bolts are tightened to the specified torque for the clutch pressure plate as noted in the manufacturer's shop manual.

**Note:** RDSD has a selection of adapters, although it is sometimes necessary to drill or otherwise modify these adapters or the engine flywheel to facilitate this installation. These modifications must be performed by a qualified machinist to ensure precise alignment and balance and to avoid unsafe vibration. Studs and hardened nuts (generally identified by hash marks on the nut face) should be used for this installation.

113 If not already installed, put the 12 studs into the flywheel adapter. Do not use thread locking compound on the studs.

## 200 Pallet-to-dynamometer Installation

201 Remove all engine protective covers, caps, or plugs for ports that will be used to install cooling water connections, sensors, transducers, or thermocouples during the following steps. After removal, any permanent caps are labeled for that engine and are stored in the test cell for installation prior to shipping. Verify that all openings that are not being used for these installations are sealed. When complete, place a check on Form 751-02.

202 Using the forklift, move the pallet-mounted engine to the test cell. Push the engine back toward the dynamometer so that the drive shaft connection to the spline extension is minimized. Using the forklift and pry-bar as necessary, align the engine squarely with the bed-plate.

203 Bolt the pallet to the bed-plate, using at least four bed-plate mounting bolts. After the pallet is bolted on the bed-plate, place a check on Form 751-02.

204 Connect the drive shaft to the flywheel adapter. Ensure that the mounting studs are clean and that the threads are not damaged or worn. Use red thread locking compound and new star lock washers on the drive shaft nuts. Tighten the mounting nuts evenly and carefully by using an open end wrench, since there is not enough clearance to use a torque wrench. After the drive shaft is connected, place a check on Form 751-02.

205 Install the oil pressure sensor (mechanical or electrical transducer) in a convenient location in the oil galley. Connect the electrical leads or pressure line as required. After the sensor and electrical leads are installed, place a check on Form 751-02.

206 Install the oil temperature sensor in the oil pan. If the sensor makes contact with the oil pan, pull it back so it does not contact any metal surface. Connect the electrical leads. Usually, it is best to fabricate and install an instrumented oil pan drain plug.

If the oil is not removed from the engine (check for a tag on the dipstick), remove the oil pan plug and quickly insert the instrumented plug and tighten it snugly. After the sensor and electrical leads are installed, place a check on Form 751-02.

207 Refer to Form 751-01 to determine the engine coolant inlet and outlet connections. Install and connect the cooling water outlet temperature sensor in the correct engine port.

If the sensor makes contact with the water outlet pipe, pull it back away from the walls. Connect the electrical leads. After the sensor and electrical leads are installed, place a check on Form 751-02.

208 Attach the cooling water hoses. The inlet and outlet hoses are marked where they exit the floor. After the hoses are attached, place a check on Form 751-02.

209 Turn the water valves on at the floor to allow the cooling water to flow to and from the engine. Fill the engine and the cooling tower with coolant. After the tower is filled with coolant, place a check on Form 751-02.

210 Bleed the air from the highest point of the engine cooling system. It may be necessary to refill the cooling tower as the air in the engine is displaced with water. After the air is bled, place a check on Form 751-02.

**Note**: It is useful to install a valve in the engine water outlet housing to facilitate bleeding the system.

211 Verify that the fuel pressure transducer and temperature sensor are installed in the engine end of the fuel supply line. Additional sensors may be installed if specified on Form 751-01. The blue line is the return line, and the black line is the supply line.
When installed, place a check on Form 751-02.

**Note:** The fuel line installation requires the use of 37° AN fittings. A few of these fittings are stocked in-house, and additional fittings can be procured locally. This precludes the need to improperly modify existing fittings or to make improper fuel connections.
In no case are differing thread or fitting styles to be interconnected without proper adapters designed for this purpose.

212 Attach the fuel lines to the engine and ensure that all connections are leak-free. The lines will come from a fuel barrel. When the lines are connected, place a check on Form 751-02.

213 Connect the electrical leads for the fuel temperature sensor. When connected, place a check on Form 751-02.

214 Connect that the electrical leads for the fuel pressure sensor(s). When connected, place a check on Form 751-02.

215 Connect the throttle cable. Determine the direction of operation of the engine throttle (rack) arm. It is preferable to have closed throttle toward the front of the engine.

If it is not, it is often possible to remove the engine throttle arm and reinstall it 180° from its original location.

If necessary, install a return spring on the throttle arm (or engine speed control potentiometer) to ensure that it returns fully to idle. Attach a cable from the engine throttle arm to the throttle servo motor arm.

If the engine throttle is electronically operated, similar procedures will apply. However, the throttle cable will be attached to the engine speed control potentiometer.

216 Adjust the throttle cable. Adjust the cable so that there is a small amount of slack when the throttle actuator is fully closed. This ensures that the rack or engine speed control potentiometer is fully on the idle stop.

Ensure that the “CELL #1/CELL #2” switch, above the Cellmate II screen, is in the “CELL #2” position. Ensure that the “MANUAL/AUTO” switch, above the Cellmate II screen, is in the “MANUAL” position. Turn the cell #2 throttle amplifier power “ON” by pressing the two yellow buttons on the panel.

Ensure that the “THROTTLE” control, located on the dynamometer console, is fully counterclockwise (CCW). Check that the servo arm remains fully to CCW, which is the closed throttle position. If it does not, notify the HDET supervisor, as adjustments to the electronics will be needed. Turn the “THROTTLE” control fully clockwise (CW), which is the wide-open throttle position.

217 Ensure that the engine throttle is fully opened by visually inspecting the engine throttle arm. Virtually all diesel engines use a spring-loaded throttle arm. The cable should be adjusted so that, when at wide-open throttle on the throttle servo, the throttle arm spring is barely engaged.

Ensure that the servo operates smoothly throughout it's entire range. It may be necessary to adjust the length of the servo arm so that 90° of servo arm travel corresponds to wide-open throttle on the engine. After the throttle control operates properly, place a check on Form 751-02.

218 Connect the engine emergency fuel shutoff system. This shutoff may be an electric solenoid, a mechanical valve, or a computer controlled valve. The emergency fuel shutoff system is described on Form 751-01.

If the emergency fuel shutoff system functions properly, place a check on Form 751-02.

If the shutoff is computerized, enter NA on the Form 751-02.

219 Attach the inlet air restrictor to the engine air inlet and ensure that it is open. Visually inspect the connections for potential points of leakage. When the restrictor is installed and opened, place a check on Form 751-02.

**Note:** A rubber boot is normally used to make the connection between the engine and the restrictor.

220 Connect the inlet air temperature sensor leads. After the sensor leads are connected, place a check on Form 751-02.

221 Assemble the exhaust system from components in the test cell and connect it to the scrubber or the CVS tunnel. Ensure that the exhaust system length from the exit of the engine exhaust manifold or turbocharger outlet to the dilution tunnel is not more than 32 feet.

If the exhaust is ducted to the CVS, ensure that all tubing in excess of 12 feet from the exhaust manifold or turbocharger outlet is insulated. The test plan documented by the Project Officer on Attachment C explains where the exhaust is to be connected. Tape the exhaust system connections with metal-based tape before installing the clamps.

If the exhaust is connected to the scrubber, ensure that a restrictor is installed. The CVS system has an exhaust restrictor permanently installed. Ensure that the restrictor is open. When the exhaust is connected and the restrictor is opened, place a check on Form 751-02.

222 Verify that the temperature sensors are functional by reading the output on the Cellmate II display.

223 Verify that all accessories and hardware are installed as specified on Form 751-01 and place a check on Form 751-02.

224 Vent the engine crankcase breather (road draft tube) to the exhaust scrubber.

**300 Auxiliary Intercooler Installation**

If not required, write NA in the space provided on Form 751-02. If auxiliary intercooler installation is specified on Form 751-01, complete Steps 300 through 310. Temperature and performance specifications will be detailed by the customer on Form 751-01.

301 Locate the auxiliary intercooler. The Project Officer or Testing Supervisor will ensure that an appropriate unit is provided.

302 Position the intercooler in front of the engine. This will simplify the connection between the turbocharger outlet and the engine intake manifold with the intercooler.

303 Fabricate metal tubing to connect the turbocharger outlet to the intercooler inlet and the intercooler outlet to the engine intake manifold. Use standard exhaust tubing, sized to the diameter of the engine connections. If the intercooler connector diameter varies from the engine connections, adapters will need to be welded into the system. Use only pre-formed, smooth radius elbows to fabricate angular changes in flow direction. Ninety degree elbows may be cut to provide lesser angles.

Ensure that the interiors of the tubes are clean before installing them to the engine and intercooler. All connections must be welded to provide safe and leak-free connections. Weld washers or other attachments approximately 6 to 8 inches from the ends of the pipes, to facilitate securing the pipes to the engine.

304 To install the tubing fabricated in Step 303, use rubber connection sleeves (boots). The boots are available in many sizes, but only fabric-reinforced straight boots should be used.

305 Reinforce the connections between the tubes, the engine, and the intercooler with turnbuckles (or some other method) to ensure joint integrity under pressure.

306 Connect the water supply, located over the front center of the bed-plate, to the intercooler water inlet using adapters, hoses, and clamps as required.

307 Connect the intercooler water outlet into the drain on the south side of the test cell floor.

308 Install a sensor to control the engine intake air temperature. This temperature sensor is installed in the end of the intercooler outlet tube where it joins the intake manifold of the engine. The temperature sensor should be at least 3 inches from the intake manifold.

309 Set the engine intake air controller to the "Intercooler Outlet Temperature" specified on Form 751-01.

310 Turn the intercooler water supply on by opening the valve located on the south test cell wall. Ensure that there are no leaks in the water portion of the intercooler system. When installation is complete, place a check on Form 751-02.

311 On Form 751-02, sign your name and record the date in the space provided.

312 A technician that did not perform the installation independently inspects each of the items listed on Form 751-02. As each inspection is completed they will put a check mark on the corresponding line under the "Verified" title.

When all the installations are verified, the technician signs their name on the "Verified by" line and records the date.

## 9. Data Input

The results of the visual inspection and verification are recorded on Form 751-02.

## 10. Data Analysis

A technician reviews Form 751-02 for completeness and independently reviews each of the checks. If all the specifications are met, the technician signs their name in the "Validated by" space and records the date.

## 11. Data Output

Forms 751-01 and 751-02 are placed in the test packet that is labeled with the corresponding "Engine Identification" and "Test Number."

## 12. Acceptance Criteria

12.1 All visible rotating component attachment bolts and nuts are grade 8.

12.2 The pallet-to-floor mounting bolts are present and secured.

12.3 The engine mount attachment bolts are present and secured.

12.4 All attachments, lines and hoses are secured away from rotating or hot engine components.

12.5 All attachments, lines and hoses are secured so as not to interfere with the throttle actuator cable.

12.6 With the throttle actuator in the idle position, the throttle actuator cable is not taut and the engine throttle is fully on its idle stop.

12.7 There are no external leaks of oil, fuel, or water.

12.8 The emergency fuel shutoff is attached and functional.

12.9 The engine is filled to the proper level with lubricating oil.

12.10 The cooling tower is filled to the proper level with water.

12.11 All safety shields and chains are properly installed.

12.12 Inlet and exhaust restrictors are installed and are not fully closed.

12.13 The cooling system is bled of air.

12.14 All metal-to-metal auxiliary intercooler joints are welded and all changes in flow direction are made with welded metal tubing.

12.15 Connections between the auxiliary intercooler connecting tubes are reinforced to ensure integrity under pressure.

12.16 The auxiliary intercooler temperature controller is set to the requirements on Form 751-01.

## 13. Quality Provisions

13.1 Engine shipping caps are left in place until the connections are made.

13.2 Thread locking compound is used on all rotating component attachments.

13.3 All rotating component attachment studs are grade 8 or better. All rotating component washers are correctly-sized new star lock-washers.

13.4 All auxiliary intercooler connection tubing is of welded metal construction. Only straight fabric-reinforced connection boots are used.

13.5 Deviations from this procedure may be requested by the Project Officer and documented on Form 751-01.

Deviations from this procedure not requested by the Project Officer are documented on Form 902-01. In general, these deviations will void the data. However, the customer may choose to accept the data as variant. To do this, the customer must indicate acceptance by signing and dating Form 902-01.

# Engine Identification and Test Number Assignment

The following is a description of how to generate an Engine Identification and Test Number which will be used on all paperwork associated with a given engine. The 12-character description is divided into two sections. The first eight characters are provided to TSD by the customer. The last four characters are the sequencal number assigned internally by the Cellmate II. An example of this code would be "HDØ100011234".

| HD01 0001 | 1234 |
|---|---|
| Customer supplied Identifier | Cellmate II Generated Identifier |

# HDET - Engine and Test Specifications

**Engine Identification:** _____ **Test Number:** _____

**Engine and Project Identification**

Engine Manufacturer: _____ Engine Serial Number: _____

Request Number: _____ Date: _____

Project Officer's Signature: _____

Telephone Number: _____

**Test Plan**

Required Break-in run time _____ Hours. (If not required, enter NA)

Break-In Run Modes:

| RPM | % Load | Torque | Time |
|---|---|---|---|
| _____ | _____ | _____ | _____ |
| _____ | _____ | _____ | _____ |
| _____ | _____ | _____ | _____ |
| _____ | _____ | _____ | _____ |

**Testing** (indicate number of each test)

Hot-Start Transient Test(s): _____

Cold-Start Transient Test(s): _____

Smoke Test(s): _____

Special Test(s): _____

**Additional Instructions:**

_____

_____

**Engine Information**

Aux. Intercooler: ____ Yes ____ No

Max. Intercooler Pressure Drop: _____ inches of water

Intercooler Outlet Temperature: _____ °F

Intercooler Adjustment Conditions: _____

External Oil Cooler: ____ Yes ____ No

Oil Cooler Temperature: _____ °F

Coolant Operating Temperature: _____ °F

Max. Coolant Temp: Pressurized _____ °F Non-pressurized _____ °F

Coolant Connection Location: Inlet _____

Outlet _____

Flywheel Bolt Torque _____ lb-ft



Form 751-01: 11-20-95

# HDET - Engine and Test Specifications

**Engine Identification:** _____ **Test Number:** _____

**Engine Information Continued**

Auto Enrichment: ____ Yes ____ No

Fuel Temperature (if CFR, enter CFR): _____ °F Inlet Fuel Pressure _____

Fuel Type: _____

Fuel Supply Instructions: _____

Fuel Emergency Shutoff means: _____

Smoke Test Restrictor Settings:

Inlet _____ inches of water Exhaust _____ inches of mercury

Speed _____ rpm Torque _____ lb-ft

Transient Test Restrictor Settings:

Inlet _____ inches of water Exhaust _____ inches of mercury

Speed _____ rpm Torque _____ lb-ft

Transmission: ____ Automatic ____ Manual

Engine has Temperature-dependent Emission Controls: ____ Yes ____ No

Shop Manual Supplied: ____ Yes ____ No

Engine Clutched: ____ Yes ____ No

Engine Governed: ____ Yes ____ No

Engine Shipped with Oil: ____ Yes ____ No

Engine Rotation: CW ____ CCW ____

Zero Percent (idle) Speed: _____ rpm

Engine Cranking Speed: _____ rpm

Maximum Rated Speed: _____ rpm

Maximum Safe Speed: _____ rpm

Minimum Safe Speed: _____ rpm

Total Curb Idle Transmission Torque: _____ lb-ft

Rated Peak Torque: _____ lb-ft @ _____ rpm.

Maximum Oil Temperature: _____ °F

Air Compressor Instructions: _____

Starting Procedure _____

Warm-up Procedure (if CFR, enter CFR) _____

Cool Down Procedure _____

Other Specifications: _____

# HDET - Diesel Engine Setup

**Engine Identification:** _____ **Test Number:** _____

**The engine must not be started while performing this procedure.**

| Setup | Verified | |
|---|---|---|
| _____ | _____ | Engine condition OK and all openings not used for sensors sealed |
| _____ | _____ | Pallet bolted on bed-plate |
| _____ | _____ | Drive shaft aligned and connected to flywheel |
| _____ | _____ | Oil pressure sensor installed |
| _____ | _____ | Oil temperature sensor installed |
| _____ | _____ | Coolant outlet temperature sensor installed |
| _____ | _____ | Engine coolant supply and return lines connected |
| _____ | _____ | Engine coolant system and water tower filled |
| _____ | _____ | Air bled from engine coolant |
| _____ | _____ | Fuel line temperature and pressure sensors installed |
| _____ | _____ | Fuel supply and return lines connected |
| _____ | _____ | Fuel temperature sensor electrical leads connected and opened |
| _____ | _____ | Fuel pressure sensor electrical leads connected |
| _____ | _____ | Throttle cable connected and functional |
| _____ | _____ | Emergency engine fuel shutoff installed (if computerized, NA) |
| _____ | _____ | Inlet air restrictor installed and opened |
| _____ | _____ | Inlet air temperature sensor leads connected |
| _____ | _____ | Exhaust connected and restrictor opened |
| _____ | _____ | Accessories and hardware installed |
| _____ | _____ | Intercooler installed (if none, NA) |

I have performed the steps in accordance with the requirements of Test Procedure 751.
Technician's Name: _____ Date: _____

I have verified the data in accordance with the requirements of Test Procedure 751
Verified by: _____ Date: _____

I have validated the data in accordance with the requirements of Test Procedure 751
Validated by: _____ Date: _____